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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/833,247	04/11/2001	Michael R. Bruce	AMDA.486PA	3719

7590 08/09/2005  
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EXAMINER

SETH, MANAV

ART UNIT PAPER NUMBER

2625

DATE MAILED: 08/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/833,247

Applicant(s)

BRUCE ET AL.

Examiner

Manav Seth

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***RESPONSE TO APPEAL BRIEF***

1. In view of the "Appeal Brief" filed on 27 June 2005, PROSECUTION IS HEREBY REOPENED. New grounds of rejection set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,
- (2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-10 and 14-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Wagner, U.S. Patent No. 5,798,529.

Claim 1 recites **“A method for analyzing a suspended defect in an integrated circuit die, the method comprising: removing substrate from a selected portion of the die to expose the suspected defect”**. Wagner discloses a method and device which includes a focused ion beam (FIB) which is used for both **failure analysis** and for obtaining accurate top-down line width measurements of small feature sizes (col. 6, lines 18-20; col. 9, lines 40-52) and defect at a particular position is a feature. Wagner further discloses **“The sample 130 may be a semiconductor wafer containing many integrated circuits or chips”** (col. 5, lines 42-43) and as well-known a wafer comprises of a die. Wagner further discloses **“a further object is to provide an FIB metrology device and method where accurate cross-sections, three dimensional features profile, and images thereof are obtained quickly”** (col. 3, lines 38-41). Wagner further discloses **“the high intensity focused ion beams successively etch a top surface of the feature”** (col. 3, lines 57-58).

Claim 1 further recites **“recording a plurality of images of the selected portion as substrate is being removed therefrom; and creating a three-dimensional image of the selected portion of the die with the plurality of images and analyzing the die therefrom”**. Wagner further discloses **“A low-intensity ion beams scans the feature between successive etches to produce successive top-down images of the feature. The processor overlays (combines) the successive top-down feature images to form a three-dimensional profile of the feature”** (col. 3, lines 63-67; col. 4, lines 47-59).

In addition, in order to provide more support for this well known technique of imaging while removing substrate from the wafer or the wafer die, Wagner further discloses **“The FIB cuts a cross-section in a semiconductor wafer at a desired location, while the SEM is used to monitor the cutting and observe the cross-section”** (col. 2, lines 56-58).

**Claim 2** recites “the method of claim 1, wherein the removing substrate includes cross-sectioning the die”. As discussed in the rejection of claim 1, Wagner discloses “a further object is to provide an FIB metrology device and method where accurate cross-sections, three dimensional features profile, and images thereof are obtained quickly” (col. 3, lines 38-41; col. 4, lines 1-3). Wagner further discloses “The FIB cuts a cross-section in a semiconductor wafer at a desired location, while the SEM is used to monitor the cutting and observe the cross-section” (col. 2, lines 56-58).

**Claim 3** recites “the method of claim 1, wherein removing substrate includes using a FIB”. As discussed in the rejection of claim 1, Wagner discloses a method and device which includes a focused ion beam (FIB) which is used for both **failure analysis** and for obtaining accurate top-down line width measurements of small feature sizes (col. 6, lines 18-20).

**Claim 4** recites “the method of claim 1, wherein recording a plurality of images includes using a SEM”. Wagner discloses “Instead of the second FIB source, an scanning electron microscope (SEM) may be used to scan the cross-section with an electron beam, and produce an image thereof” (col. 4, lines 22-25).

**Claim 5** recites “the method of claim 1, wherein removing the substrate includes using a FIB produced by a dual FIB/e-beam device, wherein recording a plurality of images includes using the e-beam of the dual FIB/e-beam device to create a SEM image”. As discussed in the rejection of claim 1, Wagner discloses “The high intensity focused ion beams successively etch a top surface of the feature” (col. 3, lines 57-58). Wagner further discloses “A low-intensity ion beams scans the

Art Unit: 2625

feature between successive etches to **produce** successive top-down images of the feature. The processor overlays the successive top-down feature images (plurality of images) to form a three-dimensional profile of the feature” (col. 3, lines 63-67; col. 4, lines 47-59). Wagner further discloses “Alternatively, the metrology device may have a second focused ion beam source which is angularly displaced from the first FIB source by the predetermined angle to scan the cross-section with a low-intensity ion beam to form the cross-section image. Instead of the second FIB source, **an scanning electron microscope (SEM) may be used to scan the cross-section with an electron beam, and produce an image thereof**” (col. 4, lines 18-25).

**Claim 6** recites “The method of claim 5, further comprising programming a controller adapted to control the dual FIB/e-beam device to effect the recording of a sufficient amount of SEM images to create a three-dimensional image of the selected portion” As discussed in the rejection of claim 1, the processor (controller) overlays the successive top-down feature images (plurality of images) to form a three-dimensional profile of the feature” (col. 3, lines 63-67). As well known, a processor or controller cannot perform a function until it is programmed, therefore it is apparent from the above disclosure by Wagner that the processor overlays a number of images as programmed according to the programmer, otherwise processor wouldn’t know the number of images to be overlayed to produce a three-dimensional image.

**Claim 7** recites “The method of claim 1, wherein removing substrate from the selected portion includes exposing a defect in the die, and wherein creating a three-dimensional image includes creating a three-dimensional image of the defect” Claim 7 has been similarly analyzed and rejected as per claim 1.

**Claim 8** recites “The method of claim 1, wherein creating a three-dimensional image includes combining the plurality of images of the selected portion and creating a combined image therefrom”. Claim 8 has been similarly analyzed and rejected as per claim 1.

**Claim 9** recites “The method of claim 1, further comprising using the three-dimensional image to detect a defect in the die”. In addition to the disclosure by Wagner in the rejection of claim 1, Wagner further discloses “Unlike conventional FIBs, where an image enhanced by **selective deposition** is used for **failure analysis**, the enhanced image of the FIB device 100 is accurate enough for use in actual precise feature size spatial measurements” (col. 9, lines 49-52).

**Claim 10** recites “The method of claim 9, wherein creating a three-dimensional image includes creating an image of the defect, further comprising using the image of the detected defect to analyze the defect”. Claim 10 has been similarly analyzed and rejected as per claims 9 and 1.

**Claim 14** additionally recites the use of a selected portion. As discussed in the rejection of claim 1, the fault analysis is done of a feature of the wafer (or die) and feature apparently is a particular portion. All other limitations has been similarly analyzed and rejected as per claim 1.

**Claim 15** has been similarly analyzed and rejected as per claims 1 and 14.

**Claim 16** has been similarly analyzed and rejected as per claims 15, 1 and 3.

**Claim 17** has been similarly analyzed and rejected as per claims 15, 1 and 4.

**Claim 18** has been similarly analyzed and rejected as per claims 15, 1 and 5.

**Claim 19** has been similarly analyzed and rejected as per claims 15, 1 and 6.

**Claim 20** has been similarly analyzed and rejected as per claims 15, 1 and 6.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner, U.S. Patent No. 5,798,529 as applied to claims 1-11 above, and further in view of Tatebayashi, U.S. Patent No. 5,514,957.

**Regarding claims 11 and 12**, as discussed in the rejection of claim 1, the processor (controller) overlays the successive top-down feature images (plurality of images) to **form a three-dimensional profile of the feature**" (col. 3, lines 63-67) where feature is a particular selected



Art Unit: 2625

portion. As well known, a processor or controller cannot perform a function until it is programmed, therefore it would be apparent from the above disclosure by Wagner that the processor overlays a number of images as programmed according to the programmer, otherwise a processor wouldn't know what images and the number of images to be overlayed to produce a three-dimensional image. Since the three-dimensional image is formed by the computer processor (or controller), the image can be produced and edited in any way the programmer want as it is very well known in the art of image processing using computer. Wagner uses a processor 140 (or a computer) which receives two-dimensional image signals from FIB device (160) to create a three dimensional image by combining the two dimensional images (figure 2). It is clear from the above disclosure by Wagner that all the image processing such as combining 2D images to form 3D image, is done by the computer and computer as well known can operate on electronic (digital images) only and Wagner does provide the support for this in col. 10, lines 49-51. Wagner does not teach creating a 3D image of less than the entire selected portion and editing the three-dimensional image to create an edited image of only a portion of the three-dimensional image. Examiner asserts that once the images are electronically stored, it is very well known in the art of image processing to perform image processing (editing) operations such as zooming into particular region, enhancing, etc, on the selected image and examiner further provides examples such as CT scanning and MRI imaging in medical field to further support the assertion. As well known, both CT scanning and MRI imaging works on the principle where two dimensional images of a region of an object are taken by the imaging machine and sent to the computer device, the computer device stores these images into electronic format and combines these 2D images into a three-dimensional image and further allows the user to locate the region of interest on the object's body to find the defect or fault by zooming or enhancing the resolution which is editing the three-dimensional image. Examiner further cites Tatebayashi to

Art Unit: 2625

further support the well-known teachings as used in MRI imaging in medical field. Tatebayashi discloses preparing a three-dimensional image data by combining a plurality of tomographic image data of a diagnostic portion of an object being examined (Abstract; figures 3 and 5). Tatebayashi further discloses “image data of a cross-section are edited from the three-dimensional image data, the cross-section passing through the linear ROI in a space of three-dimensional image data. On the basis of the edited image data of the cross-section, a prediction image for scan is displayed” (Abstract). Therefore, examiner asserts that keeping in view the teachings provided by Tatebayashi and the well known fact of images being electronically stored and edited, it would have been obvious for one of ordinary skill in the art at the time of invention was made to edit the three-dimensional images to create a 3D image of less than the entire selected portion and to create an edited image of only a portion of the three-dimensional image, to further enhance the region of interest analysis on the object.

**Claim 13** recites “The method of claim 12, wherein editing the three-dimensional image includes creating an image of a cross-section of the selected portion”. The limitation recited in claim 13 has been discussed in the rejection of claim 12 with respect to Tatebayashi. Claim 13 has been similarly analyzed and rejected as per claim 12.

### ***Conclusion***

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

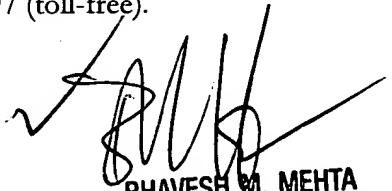
- Worster et al., U.S. Patent No. 5,479,252, discloses a system for inspection and analysis of sub-micron particles.
- Phaneuf et al., U.S. Patent No. 6,453,063, discloses a automatic focused ion beam imaging system and method.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manav Seth whose telephone number is (571) 272-7456. The examiner can normally be reached on Monday to Friday from 8:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta, can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Manav Seth  
Art Unit 2625  
August 3, 2005

  
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